EXPERIMENT DOCUMENT INFORMATION SYSTEM (EDIS)

EVOLUTION

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ABSTRACT

The EDIS is the second generation of a system designed to produce and control a document containing large amounts of text in combination with tables and graphs of mathematical/scientific data. The first generation system proved the concept, but the slow, unfriendly user interface resulted in an effort to find an off-the-shelf product to improve the interface capability while maintaining the system requirements. The basic design of that first system was combined with the hypertext concepts inherent in Hypercard to generate the much more usable EDIS. Currently in the latter stages of design, the EDIS promises to be the first step in the automation of the process required for defining complete packages of Life Sciences experiments for the Shuttle missions.

1. EXPERIMENT DOCUMENT AUTOMATION - BACKGROUND

The Life Sciences Experiment Document (ED), under control of the NASA/JSC Project Engineering Branch of the Life Sciences Project division describes a single experiment to be flown on a Shuttle Spacelab mission. It defines all functional objectives, inflight equipment, consumables, measurements, ground support, and test sessions, along with the expected results of the experiment. Preflight, postflight and training requirements also are a part of the ED. Working with Life Sciences engineering support, the Principal Investigator (PI) builds the ED using the "ED - Format and Instructions" document as a guide. The ED consists of sixteen chapters plus appendices. The fixed, or boilerplate, text contained in some sections of the ED applies to any Life Sciences experiment and references table formats that are completed by the PI with experiment-specific text and mathematical/scientific data. Other sections of the ED contain experiment text that is tailored for each experiment.

The ED is placed under configuration control in three phases, with about one third of the document placed under control following the experiment definition phase, another third placed under control at the Preliminary Design Review, and the final third placed under control at the Critical Design Review. One facility, the STI Center, is charged

with the responsibility of documenting changes requested by the ED authors and approved by the Configuration Control Board.

One of the major difficulties of ED generation using only word processing methodologies was the manual update and control of pieces of related information occurring in multiple locations, and in the case of some numerical data embedded in algorithms or graphics. The LSPD requirement to provide effective and reliable PI support for an increasing number of experiments led to their decision to automate the processes for defining, modifying, and printing ED's.

2. AUTOMATED LIFE SCIENCES EXPERIMENT DOCUMENT (ALSED) - THE FIRST GENERATION

The initial automation of the ED and the experiment description was designed on a micro-VAX, using Datatrieve, Forms Management System (FMS), and FORTRAN. This system verified the capability of combining large amounts of text with mathematical data to produce an ED, while maintaining data integrity and configuration control. However, there were limitations to the system, including slow interactive response during execution of the data base management system interface and the requirement for all data to be entered via terminal access to a host computer. Additionally, and of no small importance, the system did not include a state-of-the art user interface.

3. EDIS - THE CURRENT GENERATION

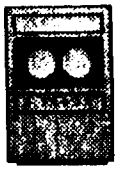
Investigation of other ways to address the same requirements led to the choice of an implementation using Macintosh HyperCard. For the second generation of ED automation, the strengths of the ALSED system design were combined with a state-of-the-art user interface.

The EDIS will be implemented in three major phases (Figure 3-1). Phase 1, currently in progress, automates the PI experiment definition process, as well as some elements of the configuration control function. In Phase 2 the EDIS user training will be initiated and automation of the configuration control functions will be completed. Phase 3 will include implementation of a data base management capability, designed to store multiple ED's and to print specialty documents relating information from multiple experiment descriptions.

EDIS IMPLEMENTATION PHASES

PI USER

CONFIGURATION CONTROL



LSPD DATA REPOSITORY

	PI USER	CONFIGURATION CONTROL	LSPD DATA REPOSITORY
Phase 1	o define and modify experiment o print & "redline" ED o request for baseline change	o process "paper" CR o print formal ED	
Phase 2	o generate Change Request	o process and print Change Request	
Phase 3	o bulletin board	o print specialty documents	o "check out" & "return" experiment description o control experiment o control specialty data bases

Figure 3-1

Products for printing high quality documents for publication have not been selected. A final determination regarding whether to use a Macintosh based data base management capability, or to implement this final phase on a main frame is still under consideration. However, the plan is to use products that interface with HyperCard, avoiding interfaces requiring extensive application programming. The user help, training, and general EDIS information will be designed to resemble a "standard" Apple/Macintosh product, to take maximum advantage of user familiarity with personal computers.

4.0 EDIS DESIGN DESCRIPTION

The EDIS interface to the PI user consists of two major components: 1) the experiment description, and 2) the experiment document, or ED. In response to EDIS requests for information, the user will describe the experiment, and that information will be reflected in the tables and graphs within the document. The ED text will be available for viewing and for editing, also.

The experiment is provided to the PI user on a diskette, "checked out" of the STI Center. The home card contains buttons providing access to the experiment description and the "paper" ED, plus orientation and installation information.

4.1 Define And Modify Experiment

In the EDIS, an experiment description is pictured as a set of sessions comprised of activities requiring equipment, measurements, samples, etc. Definition of the experiment requires specification of all of these elements within a session. An element (e.g., activity, measurement, sample, equipment, hypothesis) is defined individually, and also contains references to other elements (i.e., an activity may reference equipment). These references are presented to the user as a list (e.g., a list of the equipment items defined for an activity). The user can add to the list, delete from the list, or move to a specific element on the list to view/edit the detailed information about that element. The user is prompted for all the information about all the elements required to generate the tables contained in the formal, printed ED.

4.2 ED Text

The "boilerplate" text is all text within the ED that remains relatively constant during the definition of the experiment. The "boilerplate" text is included on the user

diskette when it is initially generated, and is determined by the type of experiment. Generation of the user diskette is a function of the configuration control process.

The ED tables of mathematical/scientific data are built from information entered by the user during the experiment definition. The user adds the current unbaselined experiment description to the ED tables by selecting the ED table update button on the EDIS main menu.

4.3 Configuration Control

Changes made to unbaselined elements of the experiment are incorporated immediately into the master ED when the diskette is returned to the EDIS configuration control administrator. Appropriate Change Notices and Change Pages are issued by the administrator, also.

The EDIS administrator builds the Formal Change Requests from the differences between the baseline copy of the experiment and the version submitted by the PI user. These requests are then submitted to the Configuration Control Board for formal approval. Following approval, the changes are implemented in the baseline experiment, and a copy can be returned to the PI user for continued inputs.

In Phase 3 of EDIS implementation, he PI user will be able to view experiment change status via a bulletin board facility.

5. EDIS - THE NEXT GENERATIONS

Following implementation of EDIS Phase 3, consideration will be given to providing a multimedia capability for including graphics and photographs in the ED. The EDIS logic will be expanded to aid the PI user in entering information specific to his particular experiment. The data base concept of storing and sharing experiment information may be extended to other aspects of LSPD mission definitions. Application of the EDIS concept to the Life Sciences requirements for Space Station will be investigated.

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